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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/812,515	03/20/2001	Ryoichi Mukai	2500.65302	2232

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EXAMINER

UHLIR, NIKOLAS J

ART UNIT	PAPER NUMBER
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1773

DATE MAILED: 04/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No. 09/812,515		Applicant(s) MUKAI ET AL.	
Examiner Nikolas J. Uhler		Art Unit 1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 March 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6, 13 and 21-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) none is/are allowed.
- 6) ☒ Claim(s) 1-6, 13 and 21-23 is/are rejected.
- 7) ☐ Claim(s) none is/are objected to.
- 8) ☐ Claim(s) none are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                             | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other:  |

### **DETAILED ACTION**

1. This office action is in response to the arguments and amendment filed 2/24/03. The applicants arguments and amendments have been carefully considered but are insufficient to render the instant application patentable over the cited prior art. However, the applicants amendments are sufficient to overcome the prior applied 35 U.S.C 112 2nd paragraph rejection. Accordingly, the prior 112 rejections are hereby withdrawn.

#### ***Claim Rejections - 35 USC § 103***

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 1-4, and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bertero et al. (US6150015) in view of Bian et al. (US6143388).
4. For the purpose of this examination, the examiner has interpreted the limitation "diffused along a grain boundary" in claims 1-6 to mean that the magnetic crystal layer comprises grains and a non-magnetic element separating the grains along the grain boundaries present in the film. This interpretation is supported by the specification, by the sentence bridging pages 14 and 15.
5. Regarding claim 1, wherein the applicant requires a layered polycrystalline structure comprising a seed layer containing a non-magnetic element at a first concentration level; a magnetic crystal layer containing non-magnetic element diffused along a grain boundary; and a non-magnetic crystal layer interposed between the seed layer and the magnetic layer, said non-magnetic crystal containing a non-magnetic element at a second concentration level smaller than the first concentration level.

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Bertero et al. teaches a magnetic recording medium comprising a substrate, a Cr or Cr alloy underlayer (equivalent to applicants seed layer) on the substrate, an ultra-thin nucleation layer on the Cr or Cr alloy underlayer, and a CoCrPt based magnetic alloy layer on the ultra-thin nucleation layer (column 11, lines 45-55).

6. Regarding the requirement in claim 1 of a non-magnetic seedlayer, it is the examiners position that it would have been obvious to one of ordinary skill in the art at the time the invention was made to select Cr as the underlayer on the substrate of Bertero et al., as Bertero et al. teaches the equivalence of Cr to an alloy of Cr as a suitable material for the underlayer. Because Cr is a known non-magnetic element, the examiner takes the position that when a Cr underlayer is utilized the underlayer is nonmagnetic, thus meeting this limitation.

7. Regarding the limitation in claim 1 requiring the magnetic layer to have a non-magnetic element diffused along a grain boundary. Bertero et al. teaches that the magnetic layer comprises a CoCrPt alloy that has grains which are isolated from one another by a solid segregant such as excess Cr in the CoCrPt alloy (column 14, lines 1-5). The examiner takes the position that isolation of grains by a solid segregant such as Cr is equivalent to having a non-magnetic element diffused along the grain boundaries of a magnetic layer. Thus, this limitation is met.

8. Although Bertero does teach the use of CoCr as a suitable material for the ultra-thin nucleation layer (column 11, lines 45-55) Bertero et al. does not teach that this layer is non-magnetic, as required by claim 1.

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9. However, with respect to this limitation, Bian et al. teaches a magnetic recording medium that is similar in structure to the material described by Bertero et al. The Bian et al. recording medium comprises a substrate, a seed layer, an underlayer, an onset layer (analogous to Bertero et al.'s nucleation layer), a magnetic layer, and an overcoat (figure 2, and column 3, lines 5+). The underlayer is typically Cr or a Cr alloy and is non-magnetic (column 3, lines 29-37). The onset layer can comprise CoCr, and can serve its function of promoting the growth of a magnetic layer having a specific crystal structure whether it is magnetic (Cr<30 at. %) or non magnetic (Cr>30 at. %) (column 4, lines 15-25).

10. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to select non-magnetic CoCr as taught by Bian et al. as the ultra-thin nucleation layer used in Bertero et al.

11. One would have been motivated to make such a modification due to the teaching in Bian et al. that non-magnetic or magnetic CoCr is equivalent for use as an onset (nucleation) layer in a multilayer magnetic recording medium. One would have further been motivated to make this modification due to the fact that the onset layer in Bian et al. and the Nucleation layer in Bertero et al. are formed on the same type of material (i.e Cr or Cr alloy) and are both used to control the crystal structure of a magnetic layer formed on the surface of the nucleation/onset layer.

12. Regarding the limitations of claim 2, wherein the applicant requires a seed crystal layer containing  $\geq 50$  at. % Cr, a Co based alloy magnetic crystal layer containing Cr atoms diffused along the grain boundaries, and a Co based non-magnetic crystal layer

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disposed between the seed layer and the magnetic layer, wherein the Co based non-magnetic crystal layer contains less Cr than the seed layer. These limitations are met as set forth above for claim 1, specifically when a pure Cr (100% Cr) layer is used as the underlayer in Bertero et al.

13. Regarding the limitations of claim 3, wherein the applicant requires the seed crystal layer to be pure Cr. This limitation is met as set forth above for claim 2.

Regarding the limitations of claim 4, wherein the applicant requires a magnetic recording medium comprising a substrate, a seed crystal layer formed on a surface of the substrate and containing a non-magnetic element at a first concentration level; a magnetic crystal layer containing a non-magnetic element diffused along a grain boundary; and a non-magnetic crystal layer interposed between the seed layer and the magnetic layer, wherein the non-magnetic crystal layer contains a non-magnetic element at a second concentration level smaller than the first concentration level. These limitations are met as set forth above for claim 1.

14. Regarding the limitations of claim 21, wherein the applicant requires the layered polycrystalline structure according to claim 1, wherein the magnetic crystal contains grains having sizes equal to corresponding grains in the non-magnetic layer as required by claim 21. regarding these limitations, it is noted that Bertero teaches that the grain size of the magnetic layer is controlled by the grain size of the ultra thin nucleation layer, as the grains of the magnetic layer epitaxially grow over the grains of the ultra thin nucleation layer, and thus the size of the nucleation layer grains controls the grain size of the magnetic layer. Thus, in light of the teaching that the grains of the magnetic layer

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epitaxially grow over the grains of the nucleation layer, and that the grain size of the nucleation layer controls the grain size of the magnetic layer, the examiner takes the position that the magnetic layer will be of equal size to that of the nucleation layer. Thus, the limitations of claim 21 are met.

15. Regarding the limitations of claim 22, wherein the applicant requires the non-magnetic crystal layer to have an epitaxial relationship to the seed crystal layer, and the magnetic layer top have an epitaxial relationship to the non-magnetic crystal layer. As stated above for claim 21, Bertero teaches the epitaxial relationship of the magnetic layer to the non-magnetic crystal layer. Further, with respect to the relationship between the seed layer and the non-magnetic crystal layer, Bertero teaches that "achieving an equilibrium or near equilibrium condition during the initial growth of the nucleation layer on the Cr or Cr alloy underlayer appears to be very critical to achieving good epitaxy between the nucleation layer and the Cr or Cr alloy underlayer" (column 12, lines 50-55). Thus, it is clear that the Cr underlayer and CoCr nucleation layer taught by Bertero meet the applicant's epitaxial relationship requirement.

16. Claims 5, 6, 13 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bertero et al. as modified by Bian et al. as applied to claim 1 above, and further in view of Okumura et al. (US5700593).

17. Bertero et al. as modified by Bian et al. does not teach an amorphous layer defined along the surface of the substrate, as required by claim 5. Further, Bertero et al. as modified by Bian et al. does not teach a Ti layer defined along the surface of the substrate, as required by claim 6.

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18. However, with respect to these limitations, Okumura et al. teaches that the crystal grains of a magnetic recording medium can be refined by forming a non-magnetic amorphous metal layer on the surface of a substrate prior to the deposition of any other non-magnetic or magnetic layers (column 2, lines 38-65). Suitable materials for forming the non-magnetic amorphous layer include pure Cr, pure V, pure Ti, or a Cr, V, or Ti alloy having an alloy composition providing an amorphous structure (column 4, lines 15-20).

19. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to form a non-magnetic amorphous Ti layer as taught by Okumura et al. between the substrate and the first non-magnetic layer in Bertero et al. as modified by Bian et al.

20. One would have been motivated to make this modification due to the teaching in Okumura et al. that the grain size of a magnetic recording medium can be improved through the deposition of a non-magnetic amorphous layer on the surface of a substrate prior to the deposition of other magnetic or non-magnetic layers. One would have specifically been motivated to choose Ti as the non-magnetic amorphous material due to the teaching of the equivalence of Ti to the other materials listed as suitable for use as the amorphous non-magnetic crystal layer by Okumura et al.

Regarding the limitations of claim 13, it is the examiners position that the limitations of this claim are met as set forth above for claims 5 and 6 above, as the combination will result in a substrate having amorphous nucleation sites made of an aggregation of atoms existing on its surface and spaced from each other, wherein the crystalline Cr



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underlayer covers the surface of the substrate and grows from the nucleation sites. It is further respectfully noted that the formation of the amorphous seedlayer and the underlayer of Okumura is formed by sputtering a non-magnetic metal onto the surface of the substrate in an atmosphere of oxygen, followed by subsequently depositing the underlayer (column 5, lines 1-15). This method is substantially similar to that disclosed by the applicant on page 24 of the instant specification.

21. the applicant is respectfully reminded that where claimed and prior art products are identical or substantially **identical in structure** or composition, **or are produced by identical or substantially identical processes**, a *prima facie* case of either anticipation or obviousness has been established and the burden of proof is shifted to applicant to show that prior art products do not necessarily on inherently possess characteristics of claimed products where the rejection is based on inherency under 35 USC 102 or on *prima facie* obviousness under 35 USC 103, jointly or alternatively. *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). "When the PTO shows a sound basis for believing that the products of the applicant and the prior art are the same, the applicant has the burden of showing that they are not." *In re Spada*, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). Therefore, the *prime facie* case can be rebutted by **evidence** showing that the prior art products do not necessarily possess the characteristics of the claimed product. *In re Best*, 562 F.2d at 1255, 195 USPQ at 433.

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22. Regarding claim 23, wherein the applicant requires the surface of the substrate to be amorphous. Bertero teaches that suitable substrate materials include glass, aluminum coated with NiP, ceramic, etc... (column 15, lines 54-65).

23. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a glass substrate as the substrate in Bertero, as this material is recognized to be equivalent to the other materials listed as suitable for forming the substrate.

24. Regarding the limitations in claim 23 requiring the surface of the substrate to be amorphous. The examiner takes the position that this limitation is met when glass is used as the substrate in Bertero, as glass is known to be an amorphous material.

#### ***Response to Arguments***

25. Applicant's arguments with respect to claims 1-6, 13, and 21-23 have been considered but are moot in view of the new ground(s) of rejection. Although these arguments have largely been addressed above, the examiner feels that there are a few arguments that would be beneficially addressed in this section.

26. In particular, the applicant argues that the examiner utilized impermissible hindsight to come to the conclusion that it would have been obvious to one of ordinary skill in the art to utilize non-magnetic CoCr as taught by Bian as the CoCr nucleation layer of Bertero, in light of the fact that neither Bertero nor Bian teach any particular motivation for introducing a non-magnetic property into the nucleation layer utilized by Bertero.

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27. The examiner agrees that neither Bertero nor Bian teach a particular motivation to make the CoCr layer non-magnetic. However, Bian clearly teaches the equivalence of non-magnetic CoCr to magnetic CoCr as a nucleation layer for a magnetic layer, as stated above. The applicant is respectfully reminded that substitution of equivalents **requires no express motivation as long as the prior art recognizes the equivalency.** *In Re Fount* 213 USPQ 532 (CCPA 1982); *In Re Siebentritt* 152 USPQ 618 (CCPA 1967); *Grover Tank & Mfg. Co. Inc V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950). Thus, applicant's argument relating to lack of motivation are unpersuasive.

28. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). The examiner established the equivalence of non-magnetic and magnetic CoCr based on evidence gleaned solely from the prior art, namely Bian et al. Thus, this argument is unpersuasive.

29. The applicant further argues that the layered structures of Bertero and Bian references are similar to one another, as the grains in the CoCr layer of Bertero appear to be spaced from one another and is so not a continuous layer but a layer of crystal

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grains distributed on a substrate. The applicant argues that the layer of Bian is not similar to Bertero in that it moderates the lattice parameters between a non magnetic underlayer and a magnetic layer, and utilizes a non-magnetic material. This argument is not persuasive. This argument is not persuasive. Bertero does not disclose whether the CoCr layer is non-magnetic or magnetic. Bian et al. utilizes a layer formed from the same elements (Co and Cr) that is formed on the same type of underlayer (Cr), that is for the same purpose (controlling the crystal growth characteristics of a magnetic layer deposited on top of this CoCr layer). Thus, in light of all of these similarities, it is clear that the CoCr layer utilized by Bian is similar to the CoCr layer utilized by Bertero. Further, Bian establishes the use the equivalence of the use of Non-magnetic and magnetic CoCr as suitable materials for forming the CoCr layer. Thus, applicant's argument relating to the fact that Bian references using non-magnetic material is moot.

30. Regarding claim 13, the applicant argues that because the magnetic grains of Bertero grow over the crystalline grains of nucleation layer the limitation of claim 13 requiring amorphous nucleation sites existing on a surface of a substrate and spaced apart from one another are not met. The examiner respectfully points out that the applicant does not require the magnetic layer to grow from the amorphous nucleation sites in claim 13, as the applicant merely requires a "crystal layer" to be grown from the crystal sites. This limitation is met by the combination of Bertero with Bian and Okumura above, as the combination results in a substrate having an amorphous Ti layer on it, whereafter a Cr layer (crystal layer) is deposited on the amorphous Ti layer. It is the examiners position as stated above that the amorphous Ti layer will necessarily exhibit

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nucleation sites formed from aggregations of atoms, and that the Cr layer will epitaxially grow from these nucleation sites.

### ***Conclusion***

31. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhlir whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.

*nju*

nju  
April 21, 2003

*Paul Thibodeau*

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